



Unit 12 – Statistics

I Interpret line graphs

→ pages 6–8

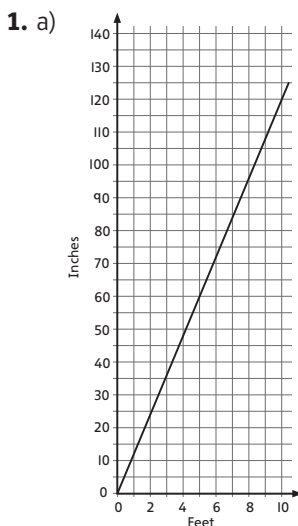
- 2:30 pm: 15 °C
5:00 pm: –3 °C
 - The temperature decreases by **24.5 °C**.
 - At approximately **4:48 pm**
 - Approximately **–5.8 °C**
- 2005: approximately **70,000**
2015: approximately **220,000**
- 110 km
 - The cyclist stopped for 10 minutes between **120 minutes** and **130 minutes**.
 - He was cycling fastest between 130 and 160 minutes.
The steeper slope of the graph line shows this.
- $\frac{1}{3}$ of the runners completed the race ($\frac{100}{300}$).
 - Approximately 30% (90 out of 300)
 - Approximately 175 runners

Reflect

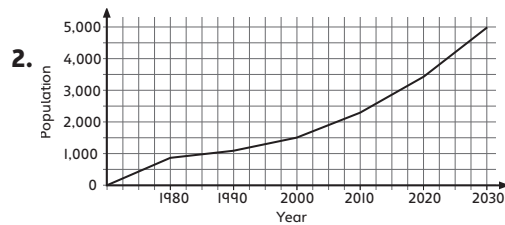
Children should mention reading the scales carefully, especially the unlabelled in between intervals on each scale, and reading the questions carefully to know which part of the graph to look at.

2 Draw line graphs

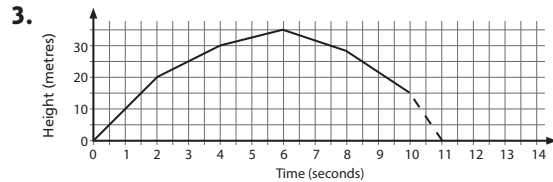
→ pages 9–11



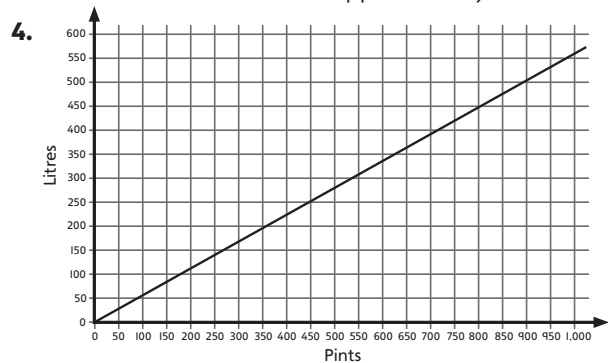
- 1 foot = **12** inches
10 feet = **120** inches
 $3\frac{1}{2}$ feet = **42** inches
 $5\frac{1}{4}$ feet = **63** inches
30 inches = **$2\frac{1}{2}$** feet
100 inches = **$8\frac{1}{3}$** feet



The population of 2030 could be approximately **5,000**.



The firework will land after approximately **11** seconds.



400 litres = **704** pints

500 litres = **880** pints

Litres	100	85	25	6
Pints	88	150	22	10

Reflect

Children should mention the scales for both axes and some key points to plot, for example, 1 km = 1,000 m.

3 Advanced bar charts

→ pages 12–14

- 130**
 - 90**
 - 195**
 - 20
 - More fiction books than non-fiction were sold altogether - approximately 865 fiction and 675 non-fiction.
- 14**
 - 17 children collected between **9** and **12** vouchers.
 - 59
 - 59
- Various responses are possible, such as:
A: How many adults visited the cinema in week 1 (week 5)?
In which week did more children than adults visit the cinema?



- B: Approximately how many children visited the cinema in week 2 (week 5)?
 How many more adults than children visited the cinema in week 1 (week 5)?
- C: Approximately how many children visited the cinema overall?
 How many more adults than children visited the cinema in week 4?

Reflect

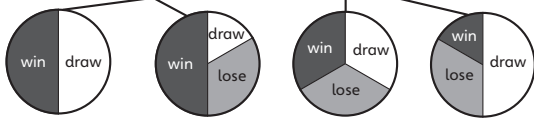
Many responses are possible, but children should mention displaying and comparing data clearly.

4 Understand and complete pie charts

→ pages 15–17

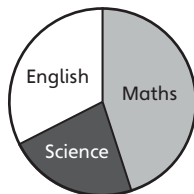
- More than half the children in Club C play cricket.
- Jessica is incorrect. The smallest section, except for 'don't know' is teacher, so teacher is the least popular job of those shown.

Team A		Team B		Team C		Team D	
win	15	win	5	win	10	win	15
lose	10	lose	10	lose	10	lose	0
draw	5	draw	15	draw	10	draw	15



4. Key

	English
	Maths
	Science



- Various responses are possible, such as:
 Pie chart: Approximately what fraction/percentage of people travel by car/train?
 More than half travel by _____.
 About $\frac{1}{4}$ of the people travel by _____.
 Bar chart: Which is the most/least popular mode of transport?
 How many people travel by car/train/cycle/walk?

Reflect

A bar chart is good for comparing categories of data and for being able to see clearly the value of each category. A pie chart is a good way to show how various parts make up a whole and to compare each set of data using fractions and percentages. It is not so easy or even possible to know the actual value of each segment of the pie. Both are good for ordering categories, most to least, for example.

5 Read and interpret pie charts

→ pages 18–20

- Pie chart completed to show 5 segments for banana, 1 for kiwi and 4 for strawberry.
 - Pie chart completed to show 3 segments for chocolate, 1 for lemon and 1 for orange. Each segment represents 2 choices.
 - Pie chart completed to show 3 segments for cats and 1 for rabbits. Each segment represents 3 animals.
- Rovers has 4 more points ($3 \times 5 + 9 = 24$ points) than Borough Town ($3 \times 5 + 5 = 20$ points). County United has $3 \times 7 + 1 = 22$ points.
 - The options are:
 5 wins, 1 draw and 9 losses
 4 wins, 4 draws and 7 losses
 3 wins, 7 draws and 5 losses
 2 wins, 10 draws and 3 losses
 1 win, 13 draws and 1 loss
- 800 people, 8 segments, each segments represents 100 people.
 Pie chart completed to show 2 segments each for 'once a week' and 'sometimes', $1\frac{1}{2}$ segments for 'every day' and $2\frac{1}{2}$ segments for 'never'.
- $32 + 28 = 60$ children in total. Each of the 10 segments represents 6 children.
 $24 + 12 = 36$ children have school dinner, 6 segments.
 $8 + 16 = 24$ children have packed lunch, 4 segments.

Reflect

Children should mention dividing the total amount represented by the number of segments.

6 Pie charts and fractions (I)

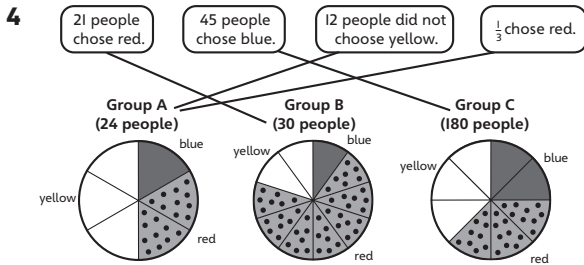
→ pages 21–23

- The horse spends $\frac{1}{6}$ of the day sleeping.
 The cat spends $\frac{1}{2}$ of the day sleeping.
 The child spends $\frac{2}{3}$ of the day awake.
 The **cat** sleeps most in a day and sleeps for **12** hours.



2. Jamilla = $\frac{5}{16}$ (10 votes)
 Isla = $\frac{3}{8}$ (12 votes)
 Aki = $\frac{1}{4}$ (8 votes)
 Bella = $\frac{1}{16}$ (2 votes)

3. Agree. Team Tigers have lost $\frac{1}{4}$ of 48 games = 12 games.
 Team Bears have lost $\frac{1}{2}$ of 20 games = 10 games.
 $\frac{1}{4}$ of 48 > $\frac{1}{2}$ of 20



5. a) Various responses are possible, such as:
 Bird seed is just less than $\frac{1}{2}$.
 Dog food is just more than $\frac{1}{4}$ but less than $\frac{1}{3}$.
 Cat food is less than $\frac{1}{4}$.
 For example, $\frac{9}{20} + \frac{7}{20} + \frac{1}{5} = 1$, this also works for part b).
 b) Answers depend on estimates for part a).
 Bird seed = $\frac{9}{20}$ of £300 = £135
 Dog food = $\frac{7}{20}$ of £300 = £105
 Cat food = $\frac{1}{5}$ of £300 = £60

Reflect

Children should note that each segment is $\frac{1}{12}$ and that some fractions can be simplified: $\frac{1}{12}, \frac{3}{12} = \frac{1}{4}$ and $\frac{8}{12} = \frac{2}{3}$.

7 Angles in polygons

→ pages 24–26

1.

Type of tree	Number seen
birch	16
oak	12
pine	4
fir	8
Total	40

2. a) $5 \times 12 = 60$ birds altogether.
 b) $\frac{1}{4}$ of 60 = 15 blackbirds
3. No, Luis threw fewer bean bags than Olivia.
 $\frac{4}{9} = 28 = \frac{1}{9} \times 252 = 28$, so Olivia threw $9 \times 7 = 63$ bean bags in total.
 Luis threw $28 + 2 = 30$ at the outer target, $\frac{1}{2}$ of his throws.
 Luis threw 60 bean bags in total.
 Olivia threw 3 more bean bags than Luis.

4. a) $\frac{5}{12}$ of the children like curry.
 $1 - (\frac{1}{4} + \frac{1}{3}) = 1 - \frac{7}{12} = \frac{5}{12}$
 b) $96 = \frac{1}{4}$ of the children surveyed.
 384 children were surveyed.
 $\frac{1}{3}$ of 384 = 128 children like pizza.
 $\frac{5}{12}$ of 384 = 160 children like curry.
5. a) Mango = $\frac{1}{14}$
 $\frac{1}{4} + \frac{2}{14} + \frac{4}{14} = \frac{7}{14} = \frac{1}{2}$
 b) $\frac{2}{14}$ or $\frac{1}{7}$ of 350 ml = 50 ml

Reflect

Many responses are possible, check that the children's pie chart sketch matches the question.

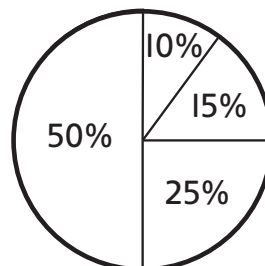
8 Pie charts and percentages

→ pages 27–29

1. 25% 16% 30%
2. Jamilla = 15 votes
 Reena = 12 votes
 Emma = 12 votes
 Zac = 21 votes
3. 24 more people shopped online than in second-hand shops.
 56 is 35%, so 8 is 5%, 16 is 10%, 160 is 100%.
 Second-hand shops = 25% = 40
 Shop online = 40% = 64
4. Both teams were equally successful.
 Both teams scored 60% of their penalties and missed 40% of their penalties.
 Rovers took $48 + 32 = 80$ penalties.
 Scored penalties = $48/80 = 60\%$
 Missed penalties = $32/80 = 40\%$
5. There are 30 more birch trees in Lanhay Forest than in Hetiddy Woods.
 Hetiddy Woods = $90^\circ = \frac{1}{4}, \frac{1}{4}$ of 80 = 20 birch trees
 Lanhay Forest = 25% of 200 = 50 birch trees

Reflect

Children should draw an approximate pie chart to show segments of 25%, 10%, 15% and 50%.





9 Introduction to the mean

→ pages 30–32

- Children should draw 3 towers of 5 cubes.
 - Children should draw 4 rows of 5 counters.
- The mean number of marbles is 4 marbles.
- Children should match A to D and B to C.
- Group A has the greatest mean.
- 150
 - 3,000
 - 200
 - 3·5

The mean is half-way along each line.

Reflect

Children could mention adding the number and dividing by 3 or making towers of equal heights from 15 cubes. The mean of 4, 5 and 6 is 5.

10 Calculate the mean

→ pages 33–35

- $2 + 4 + 6 + 4 = 16$
 $6 \div 4 = 4$
 4 in each part of the bar model.
 - 3·5 in each part of the bar model.
 - Top bar showing 1, 2, 3, 4, 5, 3.
Bottom bar showing 3 ($18 \div 6$).
- The mean capacity is 1·25 litres.
- Clark family: £76 mean weekly spend.
Kapoor family: £75·25 mean weekly spend.
The **Clark family** has the greater mean weekly spend.
- The mean length of wood is 1·6 m.
- First: Lexi ($7 \frac{1}{5}$), Second: Bella ($6 \frac{2}{5}$), Third: Richard ($5 \frac{2}{5}$)
If children included the 'no scores' when finding the mean, the answers are:
First: Bella ($6 \frac{2}{5}$), Second: Richard ($5 \frac{2}{5}$), Third: Lexi ($4 \frac{2}{5}$)

Reflect

To find the mean of a set of numbers, you add the numbers together then divide by the amount of numbers.

11 Problem solving – mean

→ pages 36–38

- Children should draw a tower of 7 cubes to total 20 cubes.
Children should draw a tower of 4 cubes to total 25 cubes.
- Emma has 1 pet.
- The fourth group earned £2·50.
- 4
 - 2 numbers with a sum of 7: **0 and 7, 1 and 6, 2 and 5, 3 and 4.**
- The total volume of jugs B and E combined should be 550 ml.
- 2 and 8 or 4 and 6
 - 3 odd numbers totalling 15: 1, 3, 11; 1, 5, 9; 3, 5, 7; 1, 7, 7
 - 4 numbers totalling 16, with 1 and 11 or 0 and 10 as two of the numbers:
0, 1, 5, 10; 0, 2, 4, 10; 1, 2, 2, 11; 1, 1, 3, 11
 - Various answers are possible, such as:
3 decimals totalling a multiple of 3: 1·4, 2·2, 2·4
mean = 2.
4 decimals totalling a multiple of 4: 2·5, 3·5, 4·5, 5·5
mean = 4.

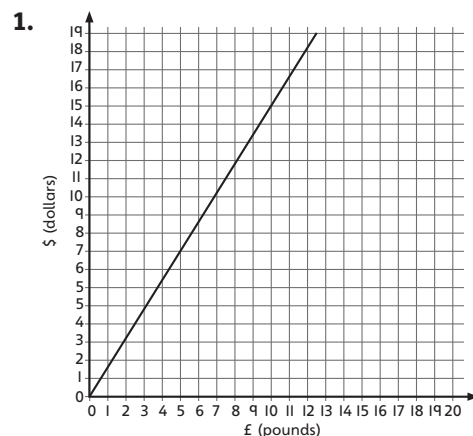
Reflect

Various sets of cards are possible, such as:
Set of 3 cards with a total of 22·5.
Set of 4 cards with a total of 30.
Set of 2 cards with a total of 15.

End of unit check

→ pages 39–41

My journal



\$19 is approximately £12·70 (accept answers ranging from £12·45 – £12·80).



2. Various responses are possible, such as:
- Pie chart: for comparing parts with a whole or easily seeing which is greatest/least.
 - Tally chart: collecting data to then display in a chart.
 - Line graph: converting between units, recording temperature changes over time.
 - Bar chart: easy direct comparison of categories of data.

Power play

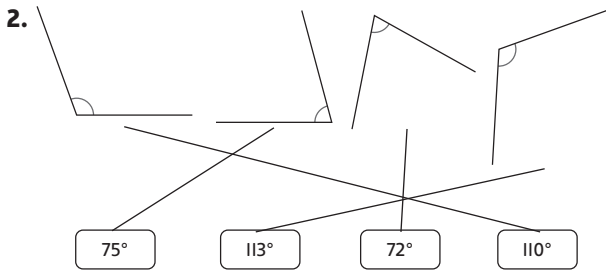
Children play the game in pairs, recording their scores by drawing a line graph. No specific answers are required.

Unit 13 – Geometry – properties of shapes

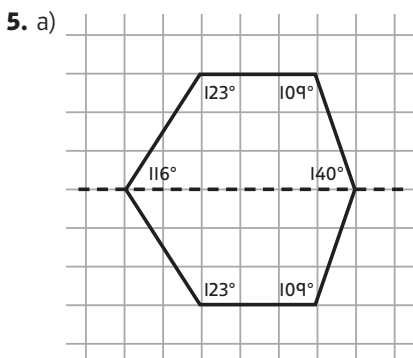
I Measure and classify angles

→ pages 42–44

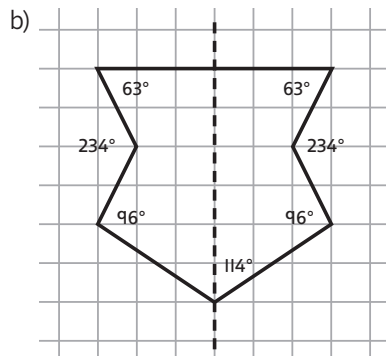
- a) 130°
b) 25°
c) 90°
d) 73°



- a) $a = 132^\circ$, $b = 111^\circ$, $c = 116^\circ$, $d = 102^\circ$, $e = 79^\circ$
(Allow 1° either way for all.)
b) Shape B is a regular shape because all of its angles are equal and all of its side lengths are equal.
- Mo is not correct. The angles are all the same size. Only the lengths of the lines increase.



(Allow 1° either way for angles, but the sum must be 720° .)



(Allow 1° either way for angles, but the sum must be 900° .)

Children may notice that angles are the same for the reflected vertices of each shape.

Reflect

Answers will vary, but children may mention some of the following: not measuring from 0° on the protractor, not lining up the protractor correctly on a line, and reading the scale incorrectly on the protractor.

2 Vertically opposite angles

→ pages 45–47

- a) 110°
b) 70°
c) 55°
d) 125°
- The third diagram does not show vertically opposite angles, as it does not show two straight lines crossing.
- a) Clockwise from top: 135° , 45° , 135° , (45°)
b) Clockwise from top: 142° , (38°), 142° , 38°
c) Clockwise from top: 114° , 66° , (114°), 66°
- Children should draw one straight line that crosses the other straight line and creates two vertically opposite angles measuring 135° .

5.

	Angle a	Angle b	Angle c	Angle d
Experiment 1	80°	100°	80°	100°
Experiment 2	120°	60°	120°	60°
Experiment 3	30°	150°	30°	150°

- a) Clockwise from top: 70° , 25° , (85°), (70°), 25° , 85°
b) Clockwise from top: 14° , (76°), 104° , 76°

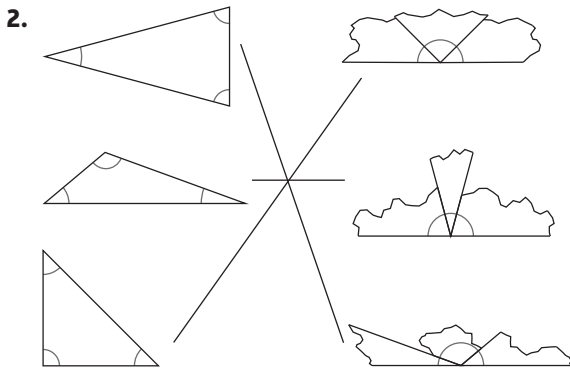
Reflect

Answers will vary, but children may recognise that vertically opposite angles are created when two straight lines cross, and that pairs of angles on a straight line are also created. Angles on a straight line add up to 180° , and if two adjacent pairs of angles on a straight line add up to 180° , then the two vertically opposite angles must be equal.

3 Angles in a triangle

→ pages 48–50

- a) Top left triangle: incorrect (70° should be 110°)
Top right triangle: correct
Bottom left triangle: incorrect (all angles should be 60°)
Bottom right triangle: incorrect (140° should be 62°)
- Children should accurately draw the triangle using a ruler and protractor. The missing angle = 30° .



3. A triangle has ...

	Always true	Sometimes true	Never true
... three acute angles.		✓	
... two right angles.			✓
... a right angle and an obtuse angle.			✓
... three different angles.		✓	
... angles that add up to 180°.	✓		
... at least two acute angles.	✓		

4. Children's answers will vary.

Reflect

Angles in a triangle always add up to 180°. Children's explanations will vary.

4 Angles in a triangle – missing angles

→ pages 51–53

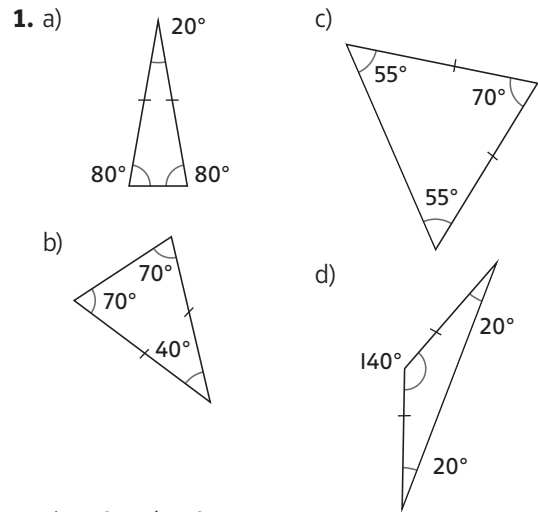
- 80°
 - 39°
 - 25°
 - 30°
- a = 70°, b = 45°, c = 65° (Children should use the fact that the angles add up to 180° in their calculation.)
- There are multiple possible answers. Some example sets of angles are:
40°, 80°, 60°; 50°, 45°, 85°; 85°, 60°, 35°.
- a = 90°, b = 280°
- x = 40°, y = 65°

Reflect

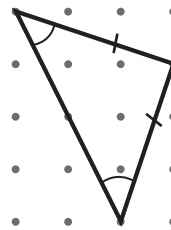
Answers will vary, but children should explain the angle properties they have used, such as the fact that the angles in the triangle add up to 180°.

5 Angles in a triangle – special cases

→ pages 54–56



- 65° and 65°
 - 12° (top right) and 156° (bottom)
 - 45° and 45°
- The third triangle is isosceles.



- Amelia's triangle could have the angles 56°, 62° and 62°, or the angles 56°, 56° and 68°.
Bella's triangle could have the angles 156°, 12° and 12° only. There is only one solution for Bella's triangle because her initial angle is obtuse.
- 25°
 - 60° (top), 60° (bottom right), 120° (middle) and 30° (bottom left)
 - 55°

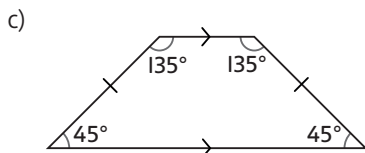
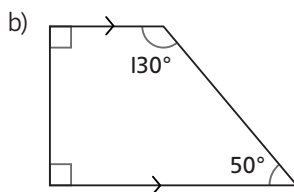
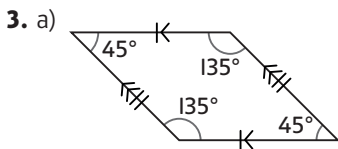
Reflect

Children's answers will vary.

6 Angles in quadrilaterals

→ pages 57–59

- Right-angled trapezium
 - Scalene trapezium
 - Isosceles trapezium
 - Parallelogram
- 70° (top left), 110° (top right), 110° (bottom left), 70° (bottom right)
 - 93° and 93°



- 125° and 125°
 - 114° and 114°
- Never true. A parallelogram either has two acute angles or four acute angles (in the case of a square or rectangle).
Sometimes true. A trapezium can have four different angles (a scalene trapezium), but it can have two equal angles (right-angled trapezium) or even two pairs of equal angles (isosceles trapezium).
- Answers will vary. Some children may realise that they can draw a rhombus, square or rectangle as a type of parallelogram.
 - Answers will vary. Children should draw a variety of types of triangles (such as scalene, isosceles and right-angled).
 - Trapeziums and parallelograms are both quadrilaterals, so they have the same angle sum.

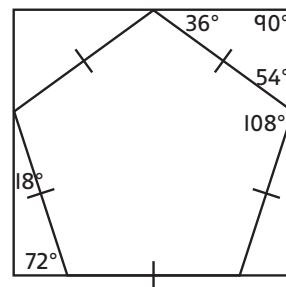
Reflect

Answers will vary, but children should show that they know the angle sum is the same (360°) in both trapeziums and parallelograms.

7 Angles in polygons

→ pages 60–62

- 25°
 - 100°
 - 50°
 - 27°
- Angle b should be 150° .
 - Angle d should be 21° .
- 2 triangles, angle total = 360° .
 - 3 triangles, angle total = 540° .
 - 4 triangles, angle total = 720° .
- Some of the angles of Emma's triangles are not at vertices of the shape. The shape splits into just two triangles.
- A decagon splits into 8 triangles. Total of all interior angles = $8 \times 180^\circ = 1440^\circ$, each interior angle = 144° .
- $a = 30^\circ$ and $b = 60^\circ$
 - Six different angle sizes can be calculated on the diagram.



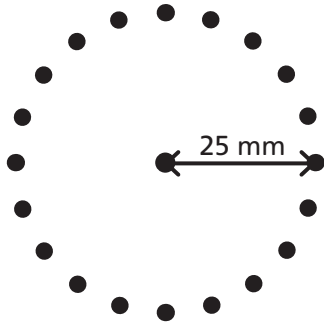
Reflect

Answers will vary, but children should use the fact that the angle sum of a quadrilateral is 360° .

8 Circles

→ pages 63–65

1. a)



- b) The dots are on a circle with a radius of **25** mm.
2. a) The radius is shown. Radius = **20** mm, diameter = **40** mm
 b) The diameter is shown. Radius = **6** mm, diameter = **12** mm
 c) The diameter is shown. Radius = **25** mm, diameter = **50** mm
3. True: The diameter passes through the centre of the circle. If the radius is x , then the diameter is $x + x$.
 False: The radius is twice as long as the diameter.
4. a) **4** mm
 b) **5.5** cm
 c) **3.4** cm
 d) **4.95** m
5. a) **1.3** mm
 b) **72** mm
6. a) Each side of the triangle is 5.6 cm, so the radius of one circle = 1.4 cm.
 b) Children's answers will vary.

Reflect

Answers will vary, but children should recognise that the radius of the circle must be 2 cm and that every point on the circle is 2 cm from the circle's centre.

9 Parts of a circle

→ pages 66–68

- The third diagram is labelled correctly.
- a) Children's answers will vary.
 b) An isosceles triangle is always formed because two sides of the triangle are radii of the circle.
- Children's answers will vary.
- Answers will vary, but children should use the fact that the angles in a triangle add up to 180° and that the angle at the circumference is a right angle.
- The area is approximately 113 square units.

Reflect

Any triangle with the diameter as one of its sides and with one vertex on the circumference of the circle will be isosceles, as two of its side lengths are radii of the circle.

10 Draw shapes accurately

→ pages 69–71

- a) Children should accurately draw a 60° angle using a protractor and ruler.
 b) Children should accurately draw a 70° angle using a protractor and ruler.
 c) Children should accurately draw an 80° angle using a protractor and ruler.
- Length = **8.6** cm (to the nearest cm), angles = **55°** (to the nearest degree)
- Children's answers will vary for the third parallelogram.
 Each parallelogram must have two pairs of parallel lines opposite each other.
- Each kite must have a line of symmetry down its main diagonal and have a pair of equal angles opposite the main diagonal.
- Children's answers will vary.
- a) The width of the rectangle must be 2 cm. It must have four right angles.
 b) The width of the rectangle must be 1.5 cm. It must have four right angles.

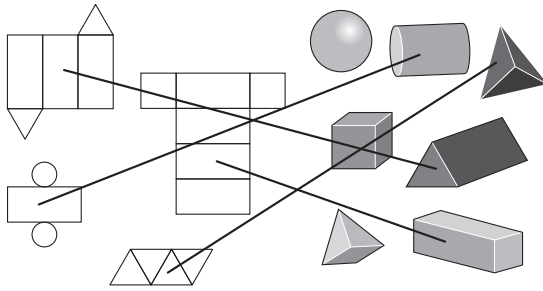
Reflect

Lee should first draw a straight line with a ruler. He should place a protractor on one end of this line and then measure 100° from the line, marking the point with a pencil. He should then connect this point to the end of the line using a ruler. Mistakes listed will vary, for example, Lee should remember which end of the line he uses when measuring the angle.

11 Nets of 3D shapes (I)

→ pages 72–74

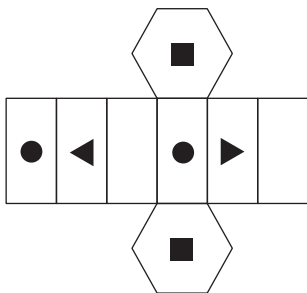
1.



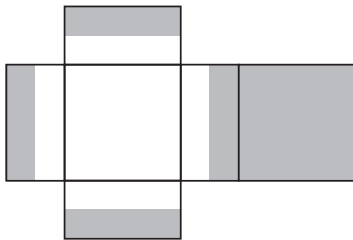
No nets are shown for the sphere, cube or square-based pyramid.

2. The two nets on the right will form pyramids.

3.



4.



5. Children's answers will vary.

Reflect

Answers will vary, but children may draw the net for a square-based pyramid or for a triangular-based pyramid (tetrahedron).

12 Nets of 3D shapes (2)

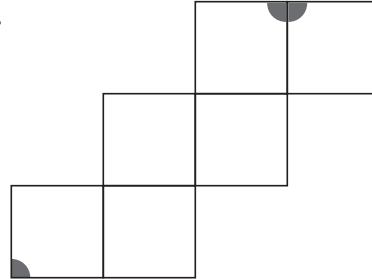
→ pages 75–77

1. Correct nets: top right, bottom left, bottom middle

2. Children's answers will vary.

3. Children's answers will vary.

4.



5. Side length = 10 cm, so volume = 1,000 cm³

Reflect

Answers will vary, but children may suggest creating the net out of paper and trying to fold it into a cube.

End of unit check

→ pages 78–80

My journal

1. $p = 18^\circ$, $q = 108^\circ$, $r = 54^\circ$

2. $a = 63^\circ$ (angles on a straight line with f); $b = 63^\circ$ (angles on a straight line, angles in a quadrilateral); $c = 99^\circ$ (angles in a quadrilateral); $d = 72^\circ$ (angles on a straight line); $e = 81^\circ$ (angles on a straight line/vertically opposite i); $f = 117^\circ$ (angles in a quadrilateral); $g = 81^\circ$ (vertically opposite angles); $h = 63^\circ$ (vertically opposite b); $i = 81^\circ$ (angles on a straight line/vertically opposite e)

3. A: not a net; B: pyramid; C: pyramid; D: cube; E: prism; F: not a net; H: prism

Power puzzle

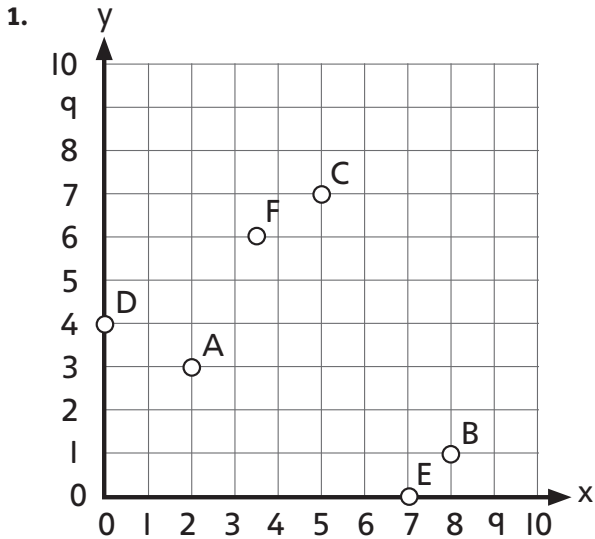
Answers will vary, but children should show a variety of shapes that they can make, such as a square, a kite, a trapezium and different types of triangles (right-angled, isosceles).



Unit 14 – Geometry – position and direction

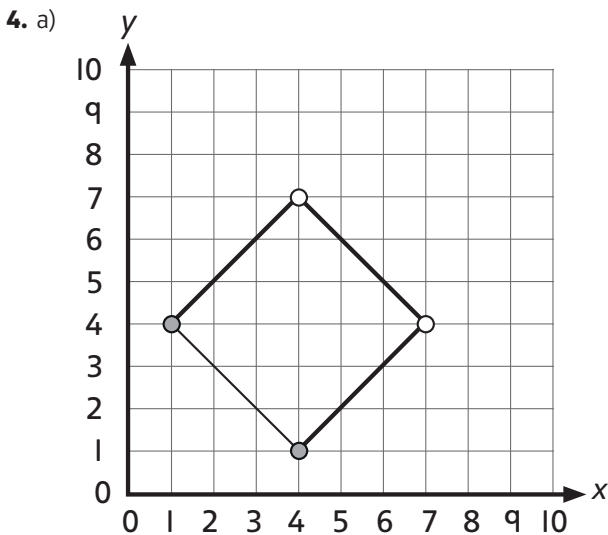
I The first quadrant

→ pages 81–83



2. A (4,7) E (7,7)
 B (6,5) F (9,7)
 C (4,3) G (10,5)
 D (2,5) H (8,4)
 I (6,5)

3. a) (1,10) and (4,10) or (1,4) and (4,4)
 b) (8,1) and (8,3) or (0,3) and (0,1)



- b) (1,4), (4,1), (4,7), (7,4)

5. A (2,4) D (8,1)
 B (8,7) E (11,1)
 C (11,4)

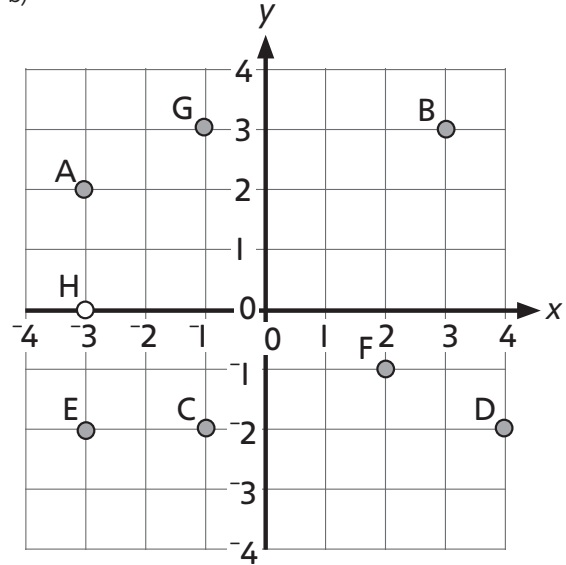
Reflect

The point will be on one of the axes.

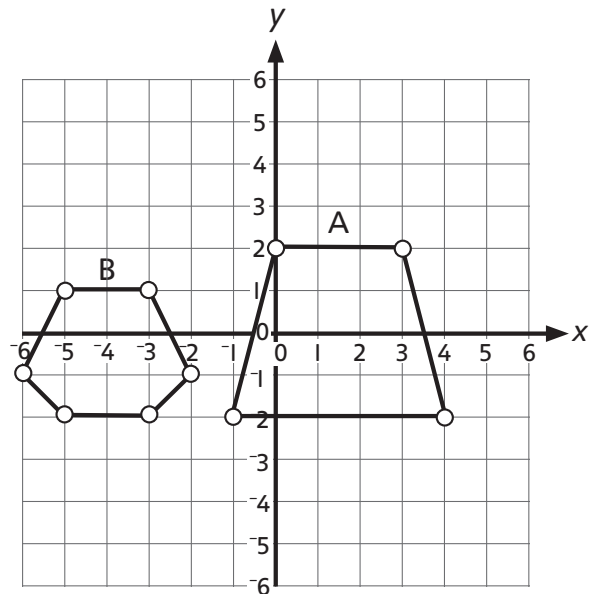
2 Read and plot points in four quadrants

→ pages 84–86

1. a) A (-3,2); B (3,3); C (-1,-2); D (4,-2)
 b)



2.



Shape A is a **trapezium** (isosceles).
 Shape B is a **hexagon** (irregular).

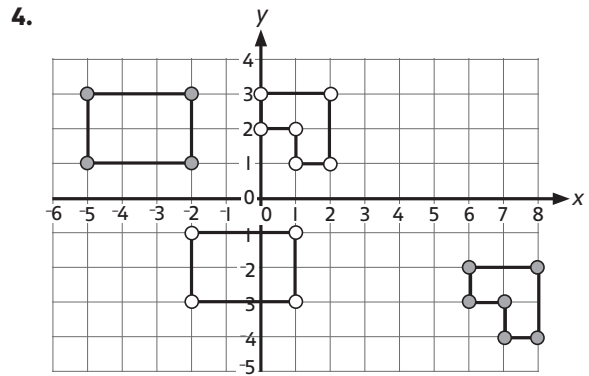
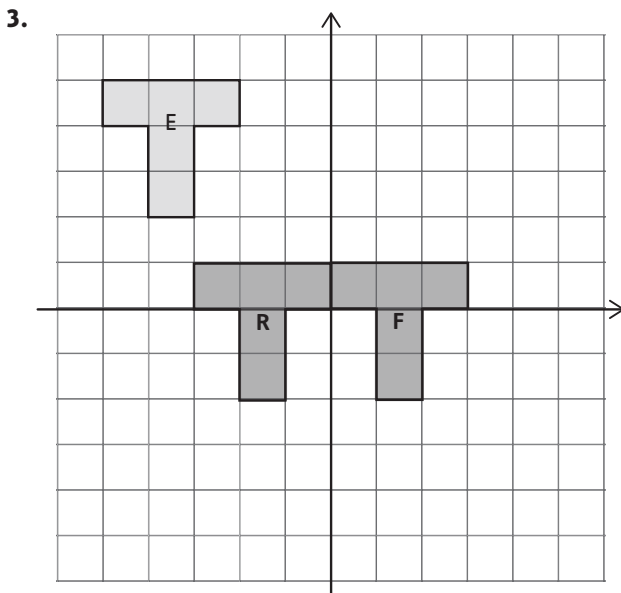
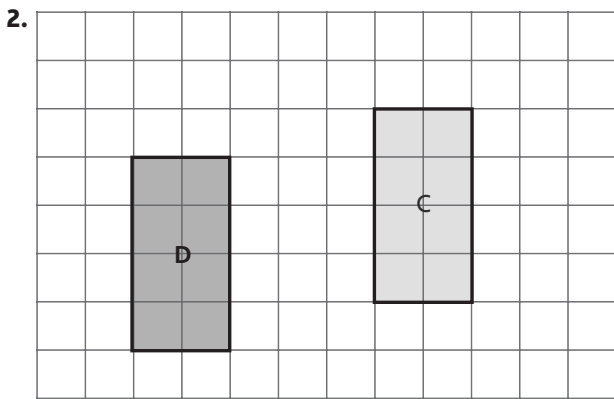
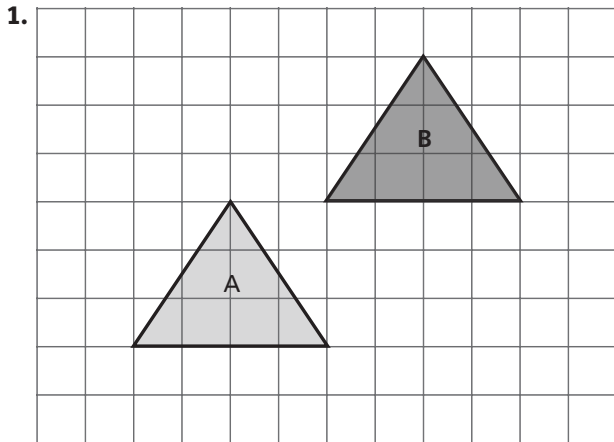
3. No, Lucy is not correct. The x-coordinate must come first, followed by the y-coordinate. Children may demonstrate on a grid that, for example, (1,5) is a different point from (5,1).
 4. Mia needs to plot the point (-3,-1) to complete her rectangle.

Reflect

Children may mention that negative numbers make it more difficult and remembering the correct combination of positive/negative in each quadrant.

3 Translations

→ pages 87–89



5. a) Shape A has been translated **6** units left and **4** units down onto shape B.
 b) Shape A has been translated **6 units down** onto shape C.

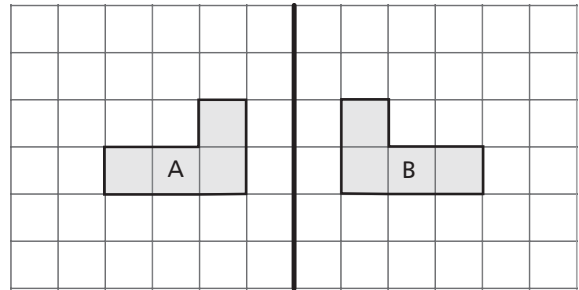
Reflect

Children should draw a simple 2D shape and then translate it. Their partner should describe the translation using left/right and up/down.

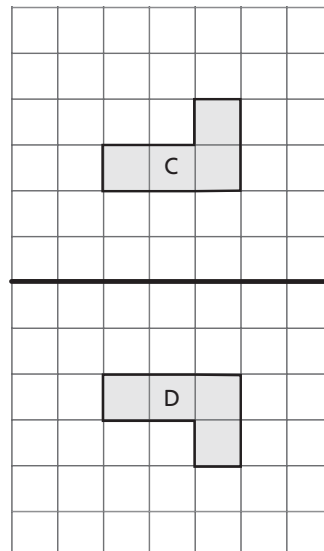
4 Reflections

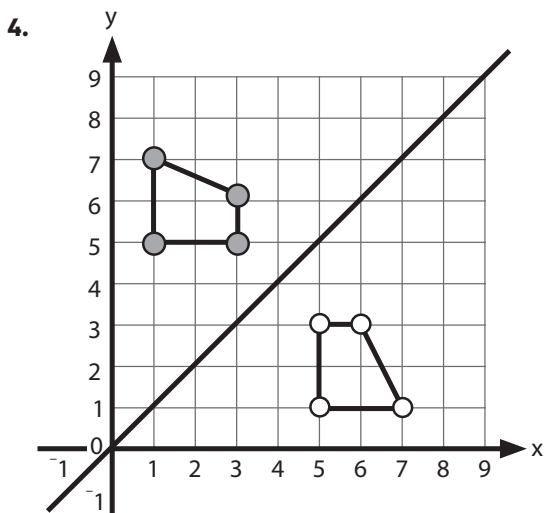
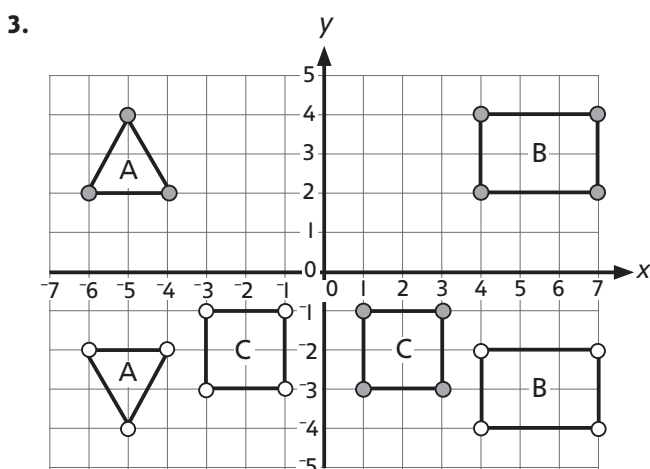
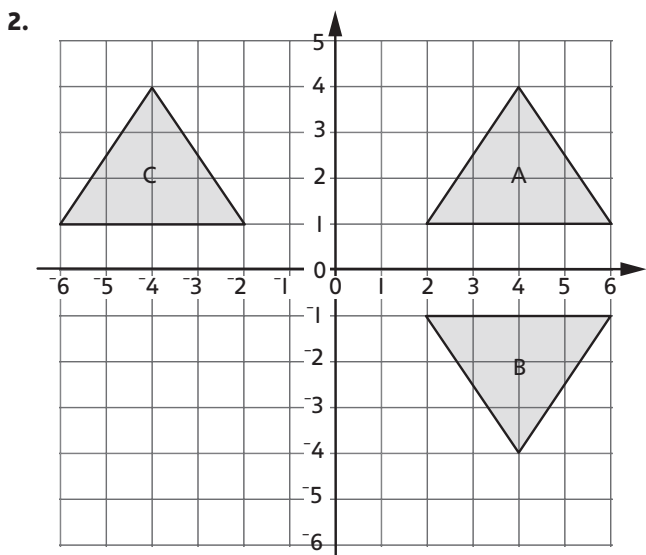
→ pages 90–92

1. a)

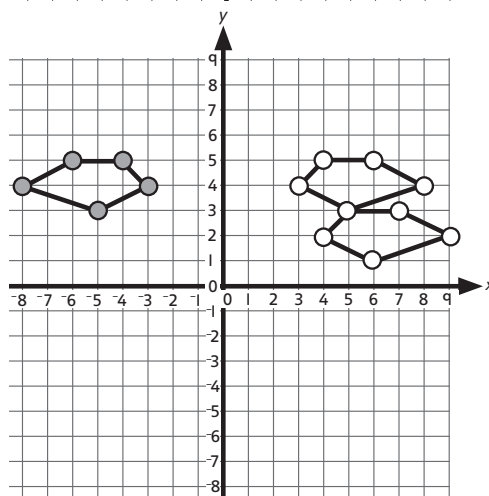
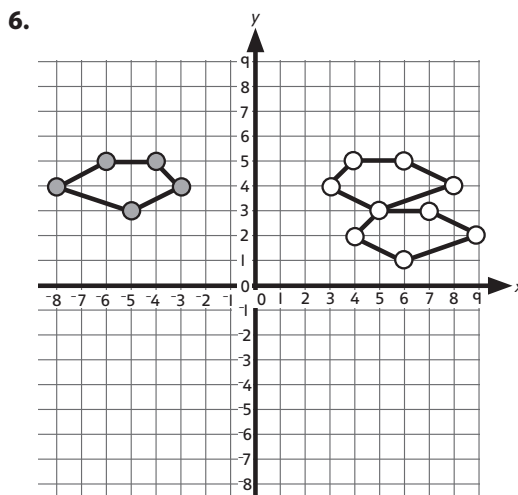


- b)





5. $(-1, 5)$, $(1, 2)$, $(-5, 5)$, $(-5, 2)$



I do get the same answer for b) as for a).

Reflect

Children should mention that in a translation, the image is exactly the same shape, size and orientation. In a reflection, the image is the same shape and size as the object, but its orientation changes depending on the line of reflection.

5 Solve problems with coordinates

→ pages 93–95

1. $(-4, 1)$ and $(-4, -1)$
 $(0, 1)$ and $(0, -1)$
2. C $(-3, -2)$; D $(1, -6)$
3. a) B $(0, 2)$; C $(-2, 5)$
b) D $(1, -5)$; E $(5, -5)$
4. A $(1, -5)$; B $(5, -5)$
5. A $(3, 2)$; B $(9, -1)$; C $(5, -4)$; D $(-1, -1)$

Reflect

Children's responses will vary.



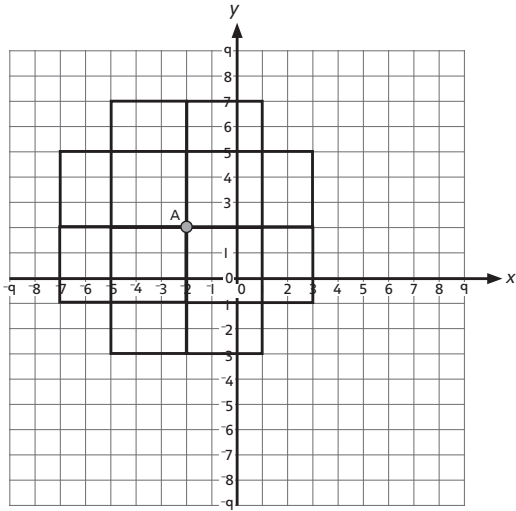
End of unit check

→ pages 96–98

My journal

- No, Kate is not correct. The coordinates give the information needed, the y-coordinates will remain the same and the new coordinates for the reflected shape will be $(-1,1)$, $(-3,1)$, $(-1,-1)$ and $(-3,-1)$.

2.



Sets of possible coordinates:

- $(-2,2)$ $(1,2)$ $(-2,7)$ $(1,7)$
- $(-2,2)$ $(1,2)$ $(-2,3)$ $(1,-3)$
- $(-2,2)$ $(-5,2)$ $(-2,7)$ $(-5,7)$
- $(-2,2)$ $(-5,2)$ $(-2,-3)$ $(-5,-3)$
- $(-2,2)$ $(-7,2)$ $(-7,-1)$ $(-2,-1)$
- $(-2,2)$ $(-7,2)$ $(-7,5)$ $(-2,5)$
- $(-2,2)$ $(3,2)$ $(3,5)$ $(-2,5)$
- $(-2,2)$ $(3,2)$ $(-2,-1)$ $(3,-1)$

Power play

No answers required.



Unit 15 – Problem solving

I Problem solving – place value

→ pages 99–101

- 56,809; 56,832; 57,483; 57,843
- Multiple of 5 circle: any number with a last digit of 5 or 0 (25, 50, 375).
Multiple of 6 circle: any even number with a digit sum of 3, 6 or 9 (18, 42, 132).
Middle segment: a multiple of 30 (30, 60, 900).
- 6,937; 6,973
7,369; 7,639; 7,693; 7,963

Days	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Sales in £	1,800	2,800	2,600	1,400	3,000	3,800

- City X could range from 482,500 to 483,499.
City Y could range from 475,000 to 484,499.
City Y could be smaller than City X.

Reflect

Many numbers are possible.

Left circle: the number must be less than 50,000 with a hundreds digit of 4 or less, for example, 19,452; 1,111; 49,399.

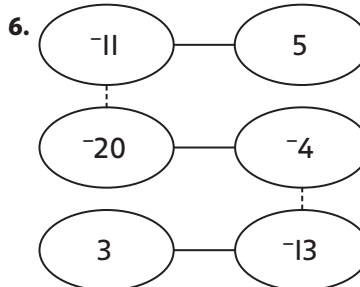
Right circle: the number must be > 50,000 with a hundreds digit of 5 or more, for example, 50,500; 60,672; 123,801.

Middle circle: a number > 50,000 with a hundreds digit of 4 or less, for example, 50,003; 81,100; 165,432; 123,412 is > 50,000 and rounds down to 123,000.

2 Problem solving – negative numbers

→ pages 102–104

- b) should be ticked.
- a) **-23**, -16, **-9**, -2, **5**, **12**
b) 19, 13, 7, **1**, -5, **-11**
c) **-35**
- a) **-9 °C**
b) Oslo and London
- Winter temperature = **-20 °C**
Summer temperature = **28 °C**
- 60, 0, 60**



Reflect

Add 24 and 40 = 64, the difference between -40 and 24 is 64. Then, divide the difference by 2 = 32.

Subtract 32 from 24 or add 32 to -40 = -8. The number half-way between 24 and -40 is -8.

3 Problem solving – addition and subtraction

→ pages 105–107

- 3,210 visitors are in the park now.
- 3,037
- There are 1,100 more children than adults.
- They sell 186 cupcakes in total.

5. a)

	Th	H	T	O	Tth	Hth
		5	3	1	9	5
+		7	8	8	2	3
	1	3	2	0	1	8

b)

	Th	H	T	O
	9	0	7	1
-	6	1	5	3
	2	9	1	8

6. $\triangle = 250$ $\square = 350$ $\text{pentagon} = 1,250$

Reflect

Children's answers will depend on which question they found the most difficult.



4 Problem solving – four operations (1)

→ pages 108–110

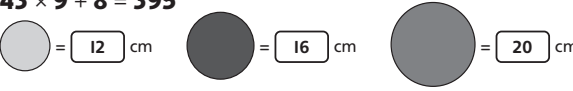
- Child ticket = £8.50 Adult ticket = £15
- 11 trips; 10 trips with 25 orders each, 1 trip for the remaining 20 orders.
- a) 42 complete bags.
b) 3 lemons and 1 lime.
- $3,125 \text{ ml} = 3.125 \text{ l}$
- $6 \div 3 = 2$, so multiplying by 6 then dividing by 2 is the same as multiplying by 2.
 $5 \times 6 \div 3 = 10$ $5 \times 2 = 10$
 $12 \times 6 \div 3 = 24$ $12 \times 2 = 10$
- There are **12** tins of red paint.
 $40 \times 3 \text{ litres} = 120 \text{ litres of blue paint.}$
 $120 \div 2 = 60 \text{ litres of red paint.}$
 $60 \text{ litres} \div 5 \text{ litres} = 12$

Reflect

Various answers are possible, but could include:
Read the question carefully.
Record the correct units in the answer.
Work out in which order to do the calculations.
Record and each calculation.
Check the answer makes sense.

5 Problem solving – four operations (2)

→ pages 111–113

- One spotty bead costs 23p.
- The height is 420 cm.
 $(3 \times 80) + (4 \times 45)$
- a) The capacity of a small bottle is 450 ml.
b) 2,700 ml (2.7 litres) more water fills 10 large bottles that fill 10 small bottles.
- $94 \times 8 + 3 = 755$
 $98 \times 4 + 3 = 395$
 $49 \times 3 + 8 = 155$
 $43 \times 9 + 8 = 395$
-  $\text{○} = 12 \text{ cm}$ $\text{●} = 16 \text{ cm}$ $\text{●} = 20 \text{ cm}$

Reflect

Children may use various strategies, such as:
 $(720 - 450) \times 25 = 270 \times 25 = 6,750 \text{ ml} = 6.75 \text{ litres}$
 $(720 \times 25) - (450 \times 25) = 18,000 - 11,250 = 6,750 \text{ ml} = 6.75 \text{ litres}$

6 Problem solving – fractions

→ pages 114–116

- $\frac{2}{6} < \frac{1}{2} < \frac{3}{4}$
- a) They sold **84** cookies altogether.
Ebo = $\frac{4}{9}$ of 108 = 48
Jamilla = $\frac{1}{3}$ of 108 = 36
 $48 + 36 = 84$
Or, in total, they sold $(\frac{4}{9} + \frac{1}{3})$ of 108 = $\frac{7}{9}$ of 108 = 84.
b) $\frac{2}{9}$ of the cookies were left.
- $\frac{7}{18}$ of the rectangle is not shaded.
- The distance from B to C is $3\frac{7}{20}$ km.
- There are 96 marbles in the bag altogether.
If $\frac{3}{8}$ are yellow, $\frac{5}{8}$ are green and red.
 $\frac{5}{8} = 60 \text{ marbles}$ $\frac{1}{8} = 12 \text{ marbles}$
 $\frac{8}{8} = 8 \times 12 = 96$
- $\frac{4}{8} \times \frac{2}{3} = \frac{1}{3}$
 $\frac{3}{5} + \frac{4}{4} = 1\frac{3}{5}$
 $\frac{3}{10} + 4 = 4\frac{3}{10}$

Reflect

$\frac{7}{12}$ is larger than $\frac{1}{2}$ as $\frac{6}{12} = \frac{1}{2}$ and $\frac{7}{12} > \frac{6}{12}$.
All of the others are less than $\frac{1}{2}$ because the numerator is less than half of the denominator.

7 Problem solving – decimals

→ pages 117–119

- 1.5 kg
- a) 65p
b) £9.20
- 3.99 4.05**
- 0.3 kg (300 g)
- | | | |
|-----|-----|-----|
| 4.6 | 5.7 | 6.2 |
| 7.1 | 5.5 | 3.9 |
| 4.8 | 5.3 | 6.4 |

Reflect

0.87 is closest to 0.9 as it has the smallest difference with 0.9.
 $0.9 - 0.87 = 0.03$
 $0.95 - 0.9 = 0.05$
 $1.01 - 0.9 = 0.11$
 $1.2 - 0.9 = 0.3$
 $0.9 - 0.08 = 0.82$



8 Problem solving – percentages

→ pages 120–122

1. £252

10% of £280 = £28 £280 – £28 = £252

Or, 90% of £280 = 9 × £28 = £252

2. 54 children walk.

Children may work out the number of children who cycle (36) and come by car (30) and subtract this from 120 or work out that 45% of the children walk.

45% of 120 = 54.

3.

Destination	Number of flights	Percentage of total flights
Other French cities	72	30%
European cities	132	55%
Cities outside Europe	36	15%

4. There were 4,500 visitors in total.

10% = 1,800 ÷ 4 = 450

100% = 450 × 10 = 4,500

5. 35% of 180 = 30% of 210

Reflect

Children should use fraction and percentage equivalents to show that:

$\frac{3}{5} = \frac{6}{10} = 60\%$ $\frac{12}{20} = \frac{3}{5} = 60\%$

9 Problem solving – ratio and proportion

→ pages 123–125

1. a) $\frac{3}{8}$ of the box is pens.

b) He has 18 fewer pens than pencils.

2. a) 30 cakes

b) 625 g of flour

3. 3 : 1

4. 13 cm

5. 3 : 5

6. The mass of a large tin is 560 g.

Reflect

Children may explain using multiplication and division:

Divide 24 by 3 to find out how many sets of 3 strawberry sweets there are (8 sets of 3).

Multiply the number of lime sweets in one set by 8:

8 × 5 = 40 lime sweets.

Children may complete a table using doubling:

Strawberry	Lime
3	5
6	10
12	20
24	40

10 Problem solving – time (I)

→ pages 126–128

1. a) 2 hours 25 minutes

b) 50 minutes

c) 10 weeks

2. a) 21 appointments in total.

b) 19:55

3. £40 for 5 full hours

4. 12 × 45 = 540 minutes = 9 hours

$\frac{1}{3}$ of 24 hours = 8 hours

12 intervals of 45 minutes is longer.

5. a) 121 days

b) 17th June

Reflect

Children should write: 10:10 pm, 22:10 and ten past ten in the evening.

11 Problem solving – time (2)

→ pages 129–131

1. a) The 16:12 is 3 minutes shorter than the 15:12.

b) It is quicker to walk. He will get to Ticebridge in time for the 15:20 bus, arriving at Bankside at 15:47. The next bus from Oak Street only gets to Bankside at 16:20.

2. Children spend 4 hours 15 minutes longer in lessons than on breaks.

3. a) 125 km

b) 1 hour 15 minutes

c) 13:05 or 1:05 pm

4. Taxi firm A is cheapest.

A: 25 minutes for £15 = 5 minutes for £3.

30 minutes = £18

B: £9.75 for 15 minutes = £19.50 for 30 minutes.

C: £3.20 for 5 minutes = £19.20 for 30 minutes.

Reflect

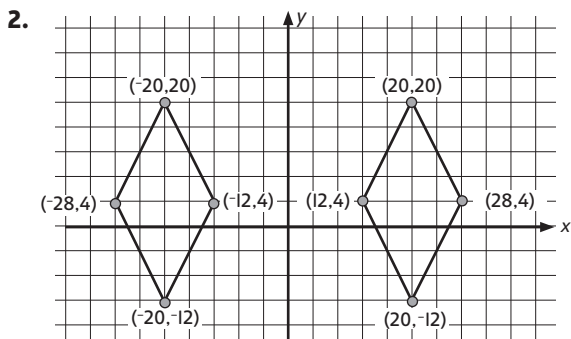
Lexi has added the times using column addition, not remembering that there are only 60 minutes in an hour, not 100.



12 Problem solving – position and direction

→ pages 132–134

1. B (-1,5) D (3,1)



3. a) A (12,14) B (12,2) C (19,2)
 b) (12,8)
 c) (16,12)

4. (5,3) (-4,-4) (2,-6) (-1,5)

Reflect

The points are on a vertical straight line going through $x = 7$, so the x coordinate of the half-way point will also be 7.

For the y coordinate, find the difference between $10 - 2 = 8$, half of $8 = 4$.

Add 4 to 2 or subtract 4 from $10 = 6$.

The half-way point is (7,6).

13 Problem solving – properties of shapes (I)

→ pages 135–137

1. a) $a = 30^\circ$
 b) $b = 42^\circ$
 c) $c = 68^\circ$ and $d = 68^\circ$

2. a) $a = 55^\circ$
 $b = 35^\circ$
 b) Angles c and d are on a straight line with angle b .
 Angles on a straight line sum to 180° .
 Subtract angle b (35°) from 180° to find angles c and d .
 Angles $c = d = 145^\circ$.
 c and d are opposite angles, so are equal.

3. $x = 28^\circ$
 $y = 100^\circ$
 $z = 52^\circ$
 You can use the trapezium to work out the answers:
 $360 - (80 + 90 + 90) = 100$, so $x = 180 - 100 - 52 = 28$.

4. $x = 100^\circ$
 $y = 60^\circ$
 $z = 200^\circ$

5. $a = 40^\circ$
 $b = 140^\circ$
 $c = 40^\circ$

Reflect

Many answers are possible, for example:

$a + b = 92^\circ$
 $a = 70^\circ$ $b = 22^\circ$

14 Problem solving – properties of shapes (2)

→ pages 138–140

1. $m = 45^\circ$

2.

	Interior angles add up to 360°	Interior angles do not add up to 360°
Have at least one pair of parallel sides	Rectangle ←	Rhombus
	Parallelogram	Regular pentagon
Have no pairs of parallel sides	Kite	Triangle
	Trapezium	Regular hexagon

3. The interior angles of a regular hexagon
 $= 120^\circ$ ($4 \times 180 \div 6$).
 $3 \times 120^\circ = 360^\circ$ which is the sum of the angles around a point.

4. $a = 120^\circ$ (properties of a rectangle)
 $b = 47^\circ$ (Angles around a point and the interior angle of regular pentagon is 108° .)

5. $e = 80^\circ$ $f = 40^\circ$

Reflect

The interior angles of a regular pentagon are 108° .
 330° is not a multiple of 108° .

The sum of the interior angles of a regular pentagon is 540° .

$540^\circ - 330^\circ = 210^\circ$

$210^\circ \div 2 = 105^\circ$, not 108° .



End of unit check

→ pages 141–143

My journal

Various steps could be described, such as:

$$\text{Rent} = 25\% \text{ of } \pounds 1,200 = \pounds 300$$

$$\text{Food} = \frac{3}{10} \text{ of } \pounds 1,200 = \pounds 360$$

$$\text{Bills/Saving} = 45\% \text{ of } \pounds 1,200 \text{ or } 1,200 - \pounds 300 - \pounds 360 = \pounds 540$$

$$\text{Bills : Saving} = \pounds 324 : \pounds 216$$

$$\pounds 216 \times 12 \times 3 = \pounds 7,776 \text{ savings in 3 years.}$$

Power puzzle

	Money spent	Arrival time	Departure time
Jamie	£7.50	13:00	14:15
Max	£2.50	10:30	13:00
Zac	£10	11:15	13:15